

Probable Transfusion-Associated Transmission of Powassan Virus, 2018

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Indiana State
Department of Health

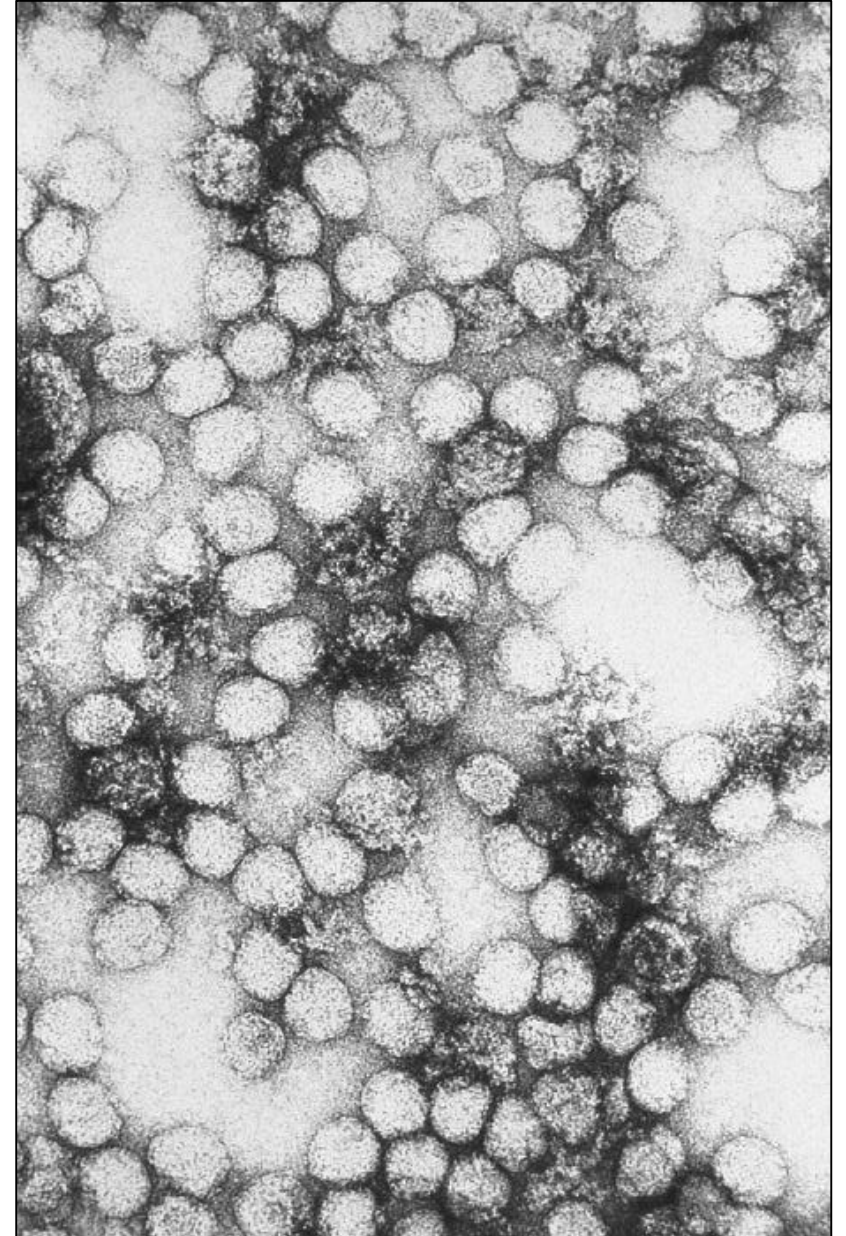
About the flaviviruses

Family Flaviviridae, genus *Flavivirus*

Prototype: Yellow fever virus

Arthropod transmission

Great public health importance



Yellow fever virus. Photo: CDC.

Most flaviviruses of public health importance are transmitted by arthropod vectors.

Mosquito-borne flaviviruses

- West Nile virus
- St. Louis encephalitis virus
- Dengue virus
- Zika virus
- Yellow fever virus
- Japanese encephalitis virus

Tick-borne flaviviruses

- Powassan virus (POWV lineage I)
- Deer tick virus (POWV lineage II)
- Tick-borne encephalitis virus
- Kyasanur Forest disease virus
- Alkhurma hemorrhagic fever virus
- Omsk hemorrhagic fever virus

Other transmission mechanisms have been established for some flaviviruses.

West Nile virus

- Blood transfusion
- Organ transplantation
- Laboratory exposure
- Mother to child

Zika virus

- Mother to child
- Sexual activity
- Blood transfusion
- Laboratory exposure
- Other?



About Powassan virus (POWV)

Tick-borne flavivirus

Rare cause of encephalitis in humans

Endemic in US in the Upper Midwest and Northeast

Vector: *Ixodes scapularis*

Reservoir: small mammals

Habitat: deciduous forests

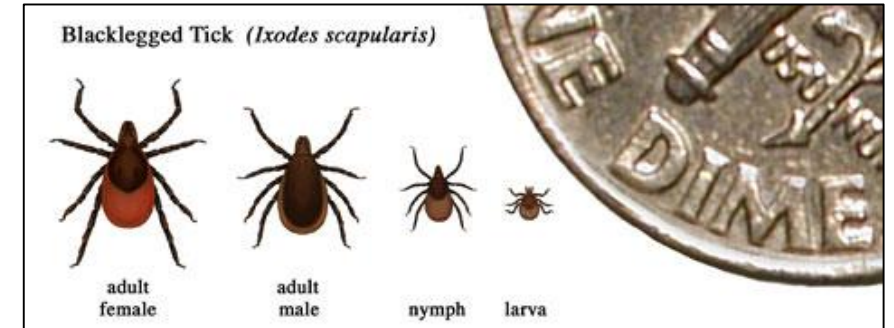
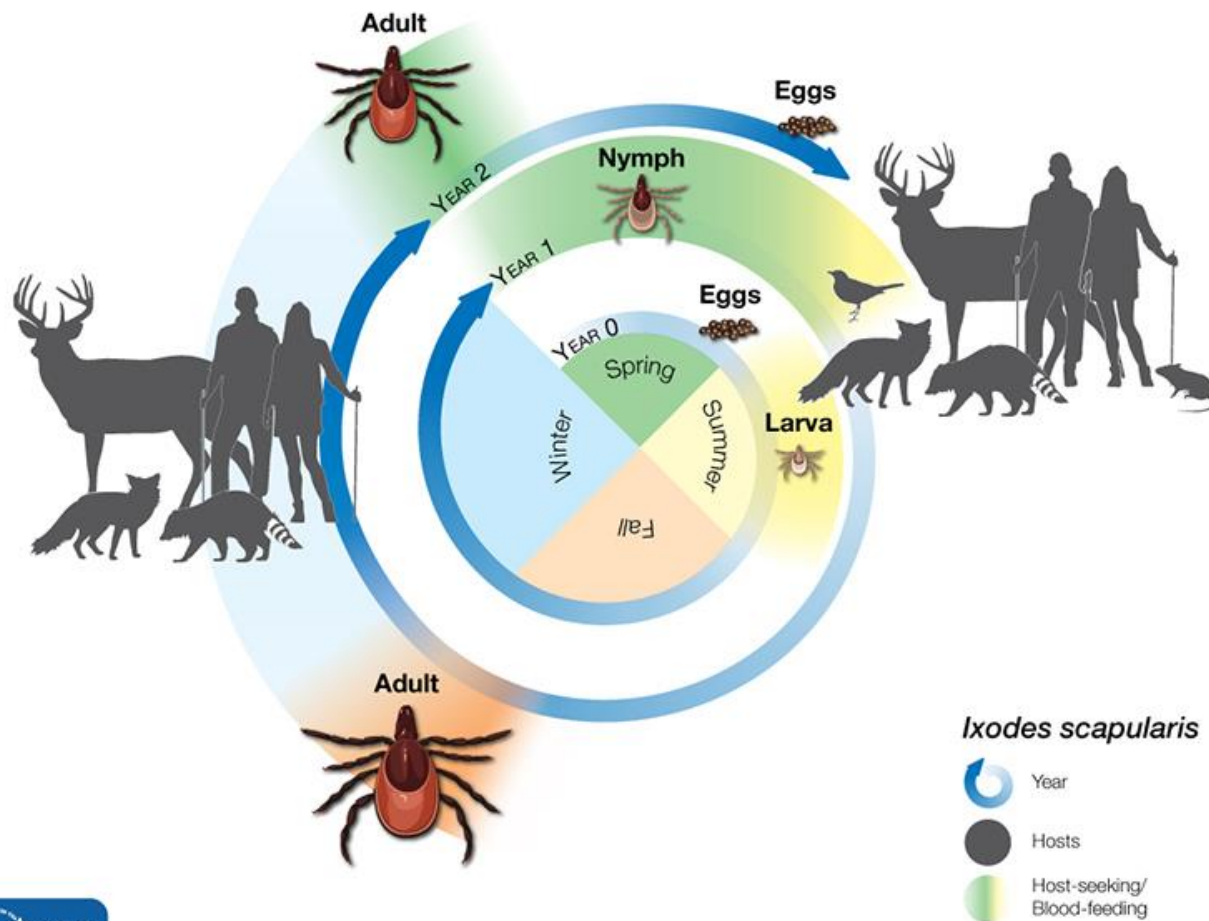


Blacklegged tick (*Ixodes scapularis*). CDC.

White-footed mouse (*Peromyscus leucopus*). CDC.

Blacklegged tick habitat. ISDH.

Ixodes scapularis is a three-host tick.



Graphic: CDC.
Photo: ISDH.

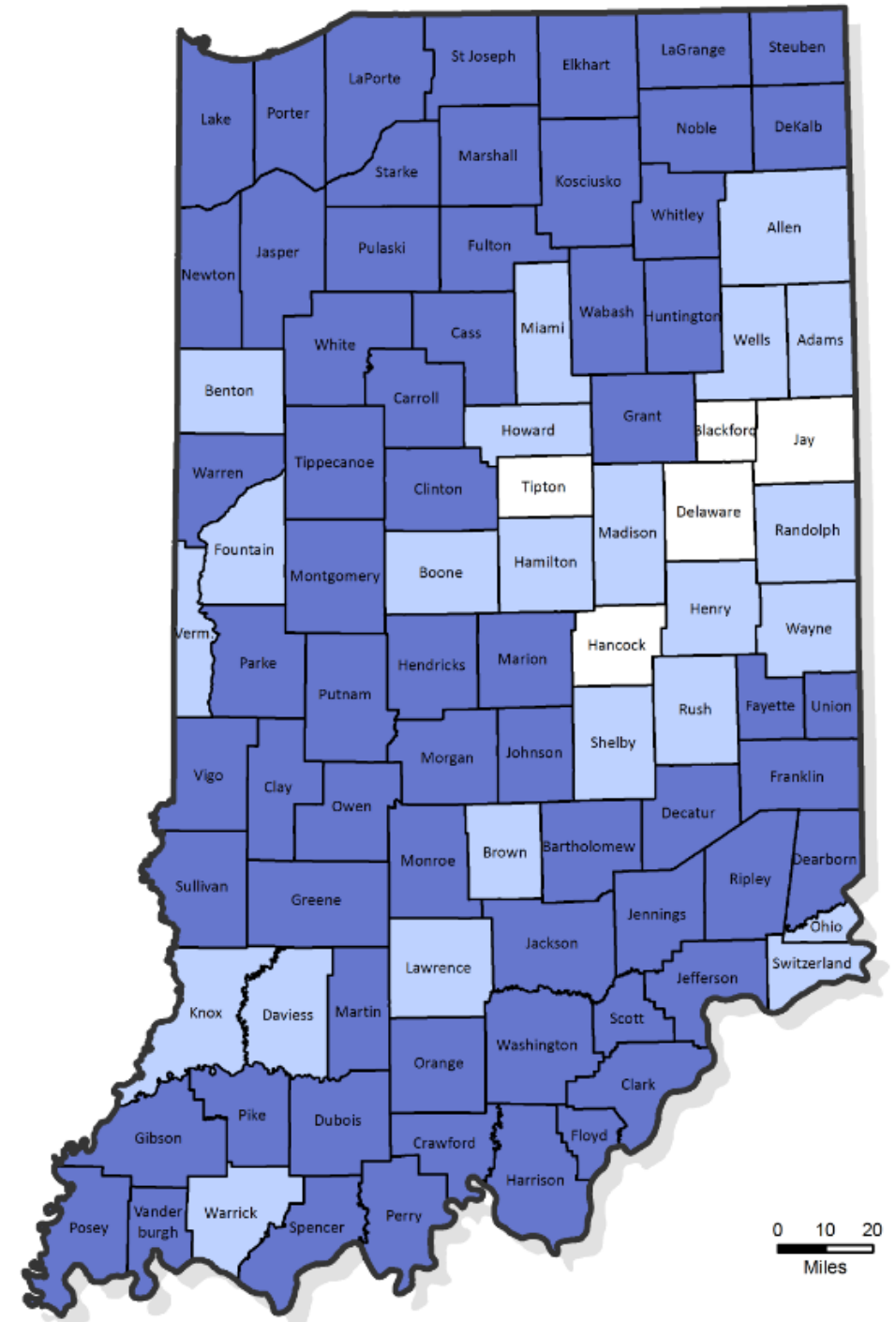
Ixodes scapularis ticks have been found in most Indiana counties.

Status



Established: 6 or more *I. scapularis* of a single life stage or more than 1 life stage collected per county within a 12 - month period

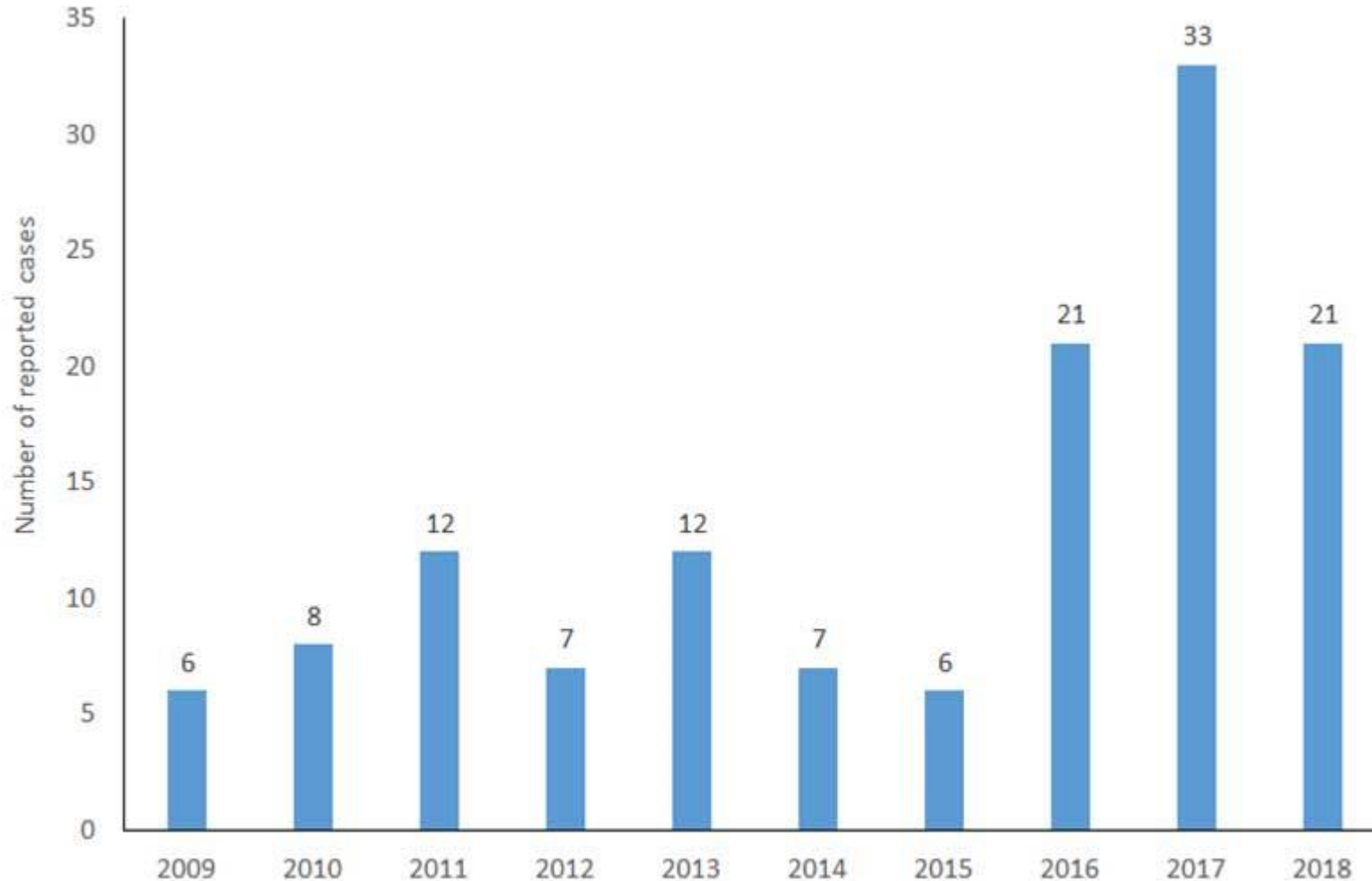
Reported: Less than 6 *I. scapularis* of a single life stage collected per county within a 12 - month period



POWV is a rare cause of encephalitis in humans.

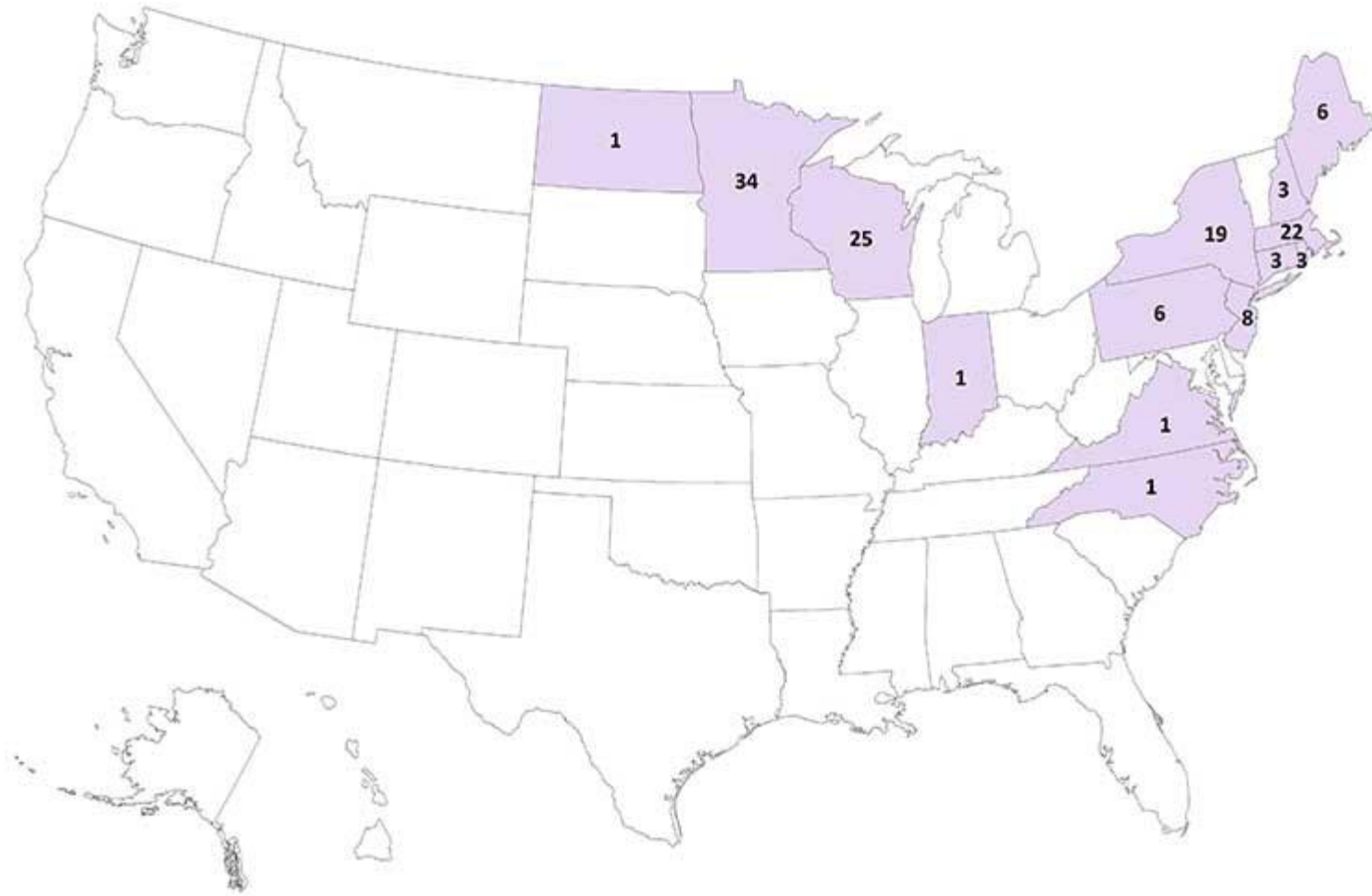
- Incubation period: one week to one month
- Initial symptoms
 - Fever
 - Headache
 - Vomiting
 - Weakness
- Severe disease: meningitis or encephalitis
- Fatality rate for those with severe disease: 10%
- Half of those who survive severe disease have long-term complications

An average of 13 POWV cases were reported annually in the US during the last 10 years.



In the US, most POWV cases are reported in the Upper Midwest and the Northeast.

Reporting period: 2009–2018



In July 2018, ISDH was notified that an Indiana resident had positive laboratory tests for multiple flaviviruses.

- Hospitalized with encephalitis in Wisconsin
- Past medical history of systemic lupus erythematosus
- Recent kidney transplant
- No international travel
- Ongoing neurological symptoms

2018

● Indiana ● Wisconsin

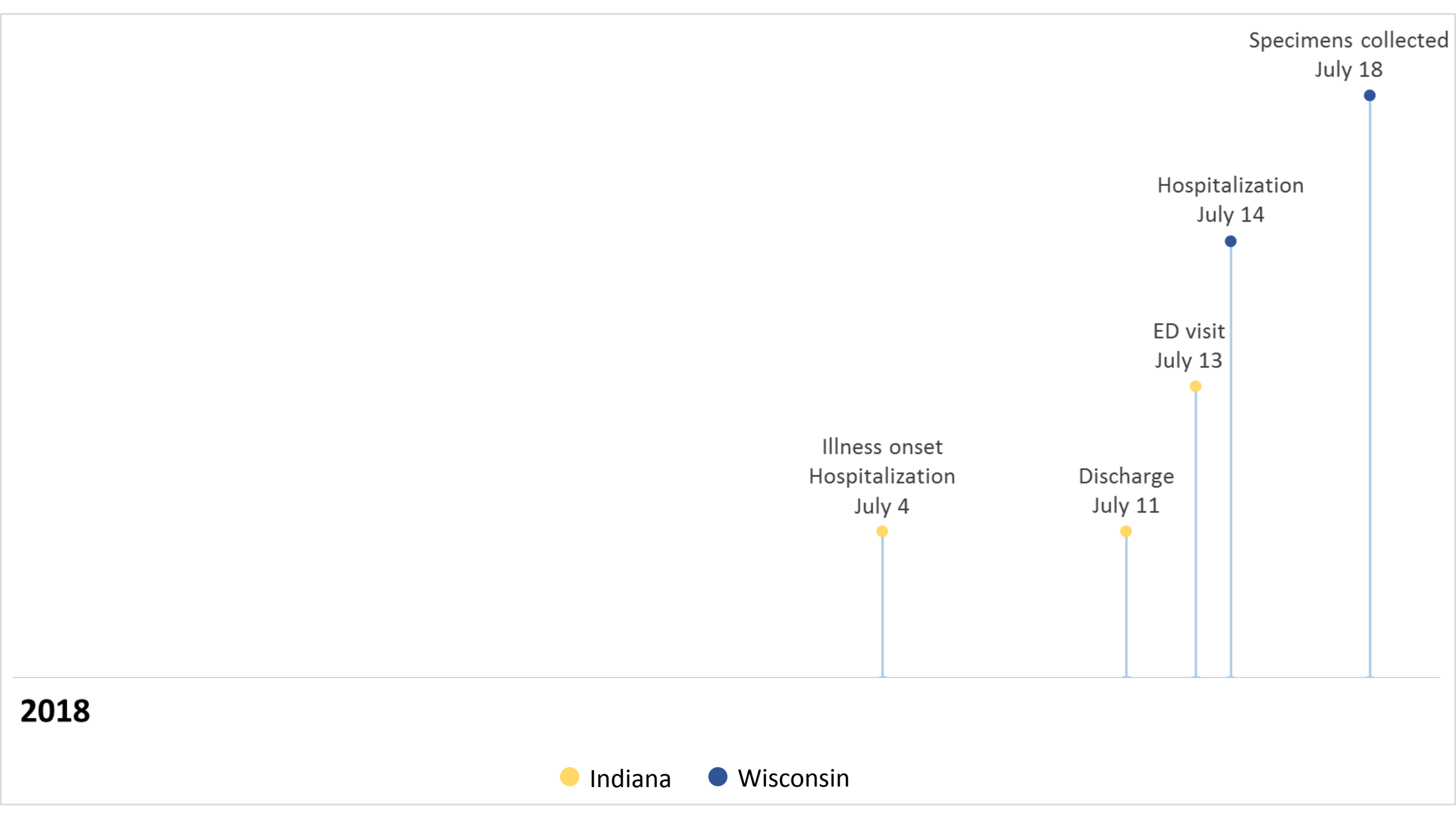
Illness onset
Hospitalization
July 4

Discharge
July 11

ED visit
July 13

Hospitalization
July 14

Specimens collected
July 18

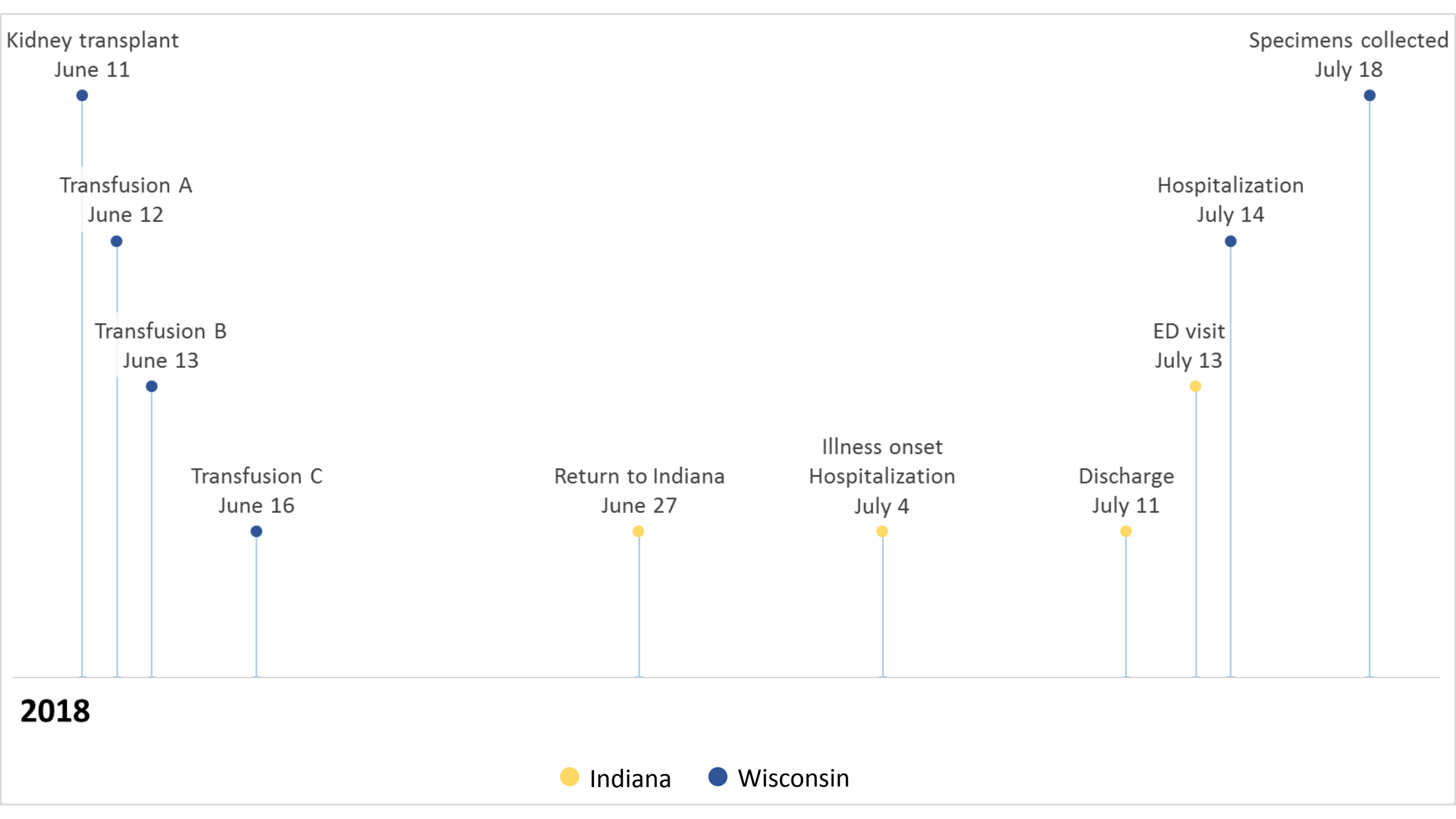


Patient lab testing

		Prior to Illness Onset		After Illness Onset		
		6/10/2018 serum	6/27/2018 serum	7/18/2018 CSF	7/18/2018 serum	7/23/2018 serum
Powassan virus	PCR	-	-	-	-	-
	IgM	-	-	+	+	+
	PRNT	<10	<10	<10	10	320
Zika virus	IgM				-	equivocal
	PRNT				<10	<10

Four possible exposure mechanisms were investigated.

- Tick exposure in Wisconsin
- Tick exposure in Indiana
- Organ transplantation
- Blood transfusion



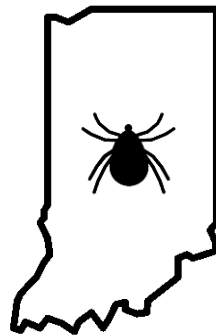
Tick exposure in Wisconsin



Tick exposure
in Wisconsin



Tick exposure
in Indiana



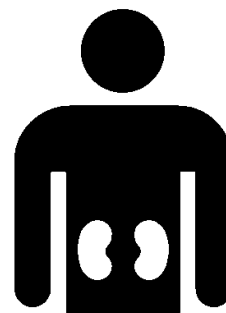
Tick exposure
in Wisconsin

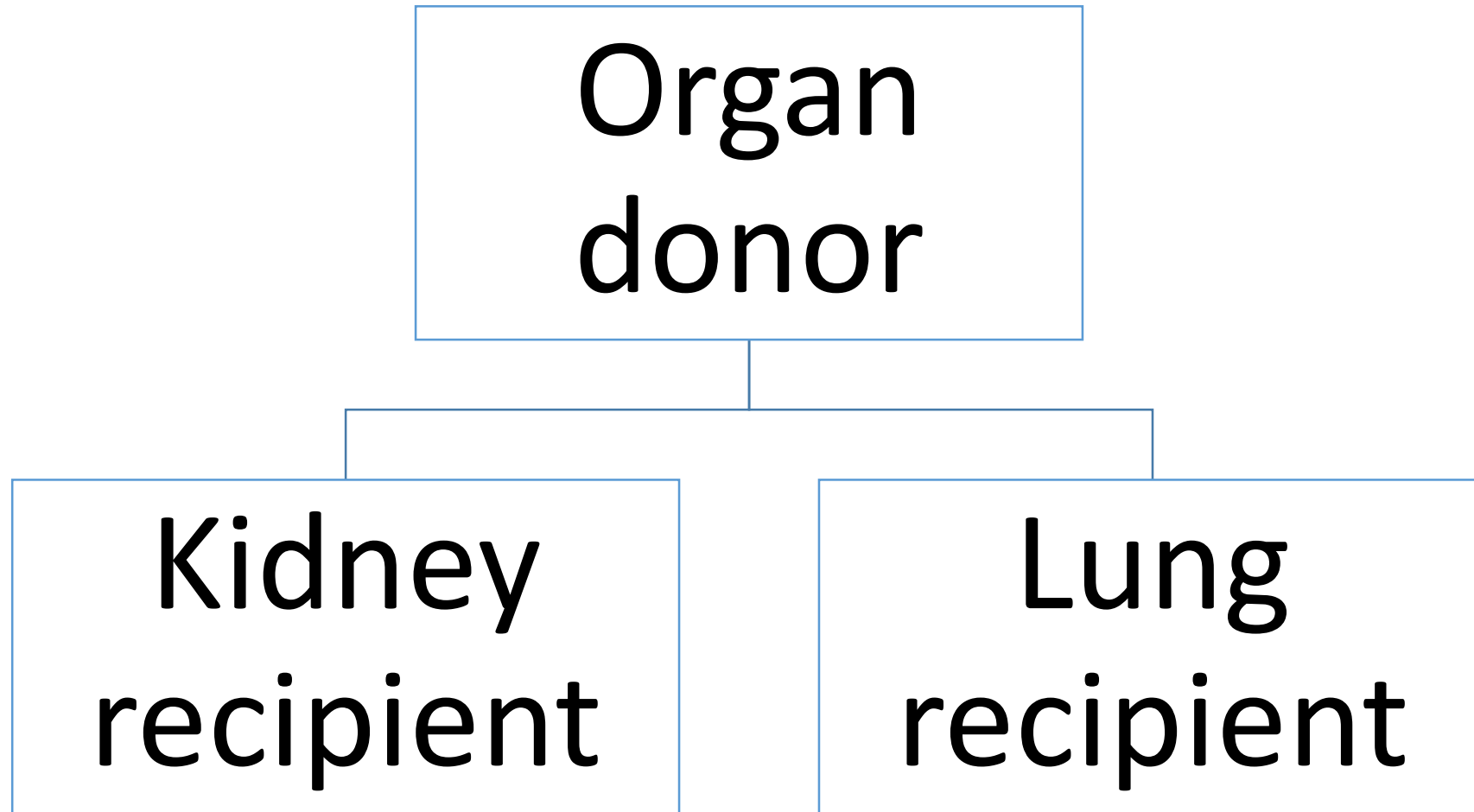


Tick exposure
in Indiana



Organ
transplantation







Organ donor lab testing

		6/8/2018 serum	6/8/2018 plasma
Powassan virus	PCR	-	-
	IgM	-	
	PRNT	<10	



Lung recipient lab testing

		9/4/2018 serum
Powassan virus	PCR	
	IgM	-
	PRNT	<10

Tick exposure
in Wisconsin



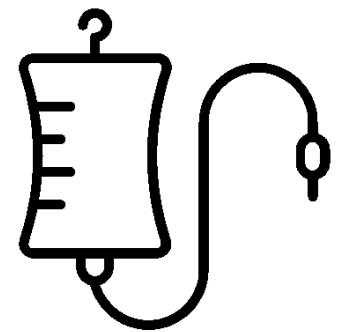
Tick exposure
in Indiana



Organ
transplantation



Blood
transfusion





Blood donor lab testing

		Donor A	Donor C
		10/8/2018 serum	10/31/2018 serum
Powassan virus	PCR		
	IgM		
	PRNT	<10	<10



Blood donor lab testing

		Donor B	
		6/6/2018 plasma	11/27/2018 serum
	PCR	equivocal	
Powassan virus	IgM	-	+
	PRNT	<10	40

Conclusions

- Blood transfusion was the likely mechanism of POWV transmission in this case
- The benefits of blood transfusion outweigh the risks
- Healthcare providers should consider POWV to be a possible transfusion-associated pathogen

Prevention

- The benefit of screening blood donations for POWV is unclear
- There is no FDA-licensed test to screen blood donations for POWV
- Pathogen reduction technologies can inactivate viruses in plasma and platelets, but not red cells or whole blood
- There is no vaccine for POWV
- All people in areas with endemic POWV and other tick-borne pathogens should take precautions against tick bites

Before you go outdoors

- Know where to expect ticks
- Treat clothing and gear with permethrin
- Use EPA-registered insect repellents



CDC.

While you are outdoors

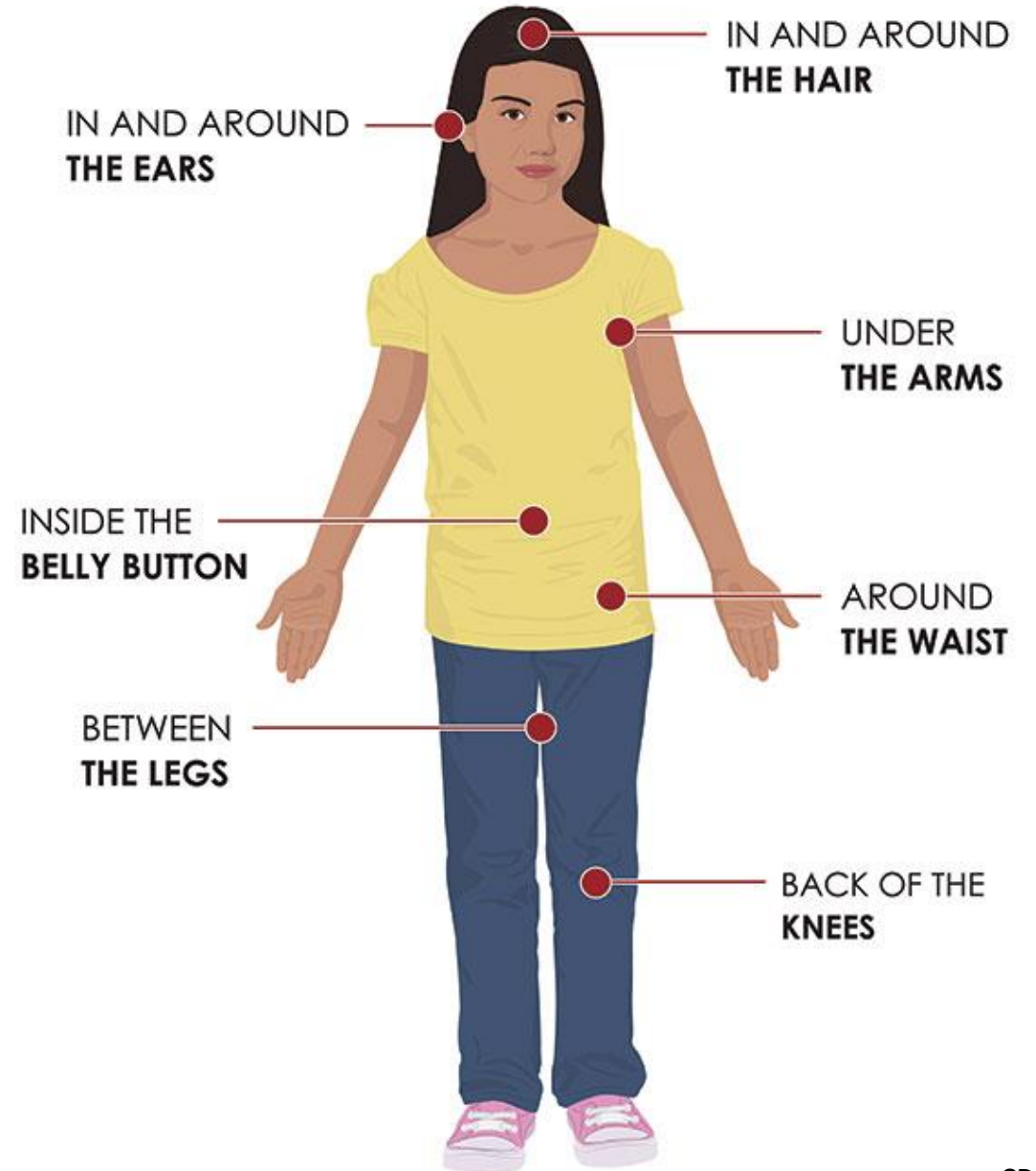
- Avoid tick habitats
- Walk in the center of trails



Brown County State Park. Kgirischandra, CC BY-SA 3.0.

After you come indoors

- Check your clothing and gear
- Check your pets
- Take a shower within 2 hours
- Check your body for ticks



How to remove a tick



Use fine-tipped tweezers. Avoid folklore remedies such as “painting” the tick with nail polish or Vaseline or burning it with a match.



Use the tweezers to grasp the tick as close to the skin as you can.



Pull upward with steady, even pressure. Don't twist or jerk the tick. Flush the tick down the toilet, or save it in a Baggie or rubbing alcohol.



After removing the tick, clean the bite area and your hands with rubbing alcohol or soap and water.

Acknowledgments

Indiana State Department of Health

- Jeanette McGavic
- Taryn Stevens

University of Wisconsin School of Medicine and Public Health

- Lindsay Taylor
- Eric Destrampe
- Elizabeth Ann Misch

UW Health

- Cathy Werwinski
- Karen Kritsch
- Jamie Myers
- Cheryl Bowman

Wisconsin Department of Health Services

- Rebecca Osborn

Centers for Disease Control and Prevention

- Trudy Chambers
- Carolyn Gould
- Olga Kosoy
- Amanda Panella
- Robert Lanciotti
- Pallavi Annambhotla
- Sridhar Basavaraju

American Red Cross

- Jamel Groves
- Susan Stramer
- John Weiss
- Ariele Worthy